higher education & training

Department:
Higher Education and Training
REPUBLIC OF SOUTH AFRICA

T460**(E)**(A9)T

NATIONAL CERTIFICATE

DIGITAL ELECTRONICS N4

(8080354)

9 April 2018 (X-Paper)
09:00–12:00

This question paper consists of 4 pages.

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DEPARTMENT OF HIGHER EDUCATION AND TRAINING
REPUBLIC OF SOUTH AFRICA

NATIONAL CERTIFICATE
DIGITAL ELECTRONICS N4
TIME: 3 HOURS
MARKS: 100

INSTRUCTIONS AND INFORMATION

1. Answer ALL the questions.
2. Read ALL the questions carefully.
3. Number the answers according to the numbering system used in this question paper.
4. ALL drawings must be neat and well-balanced.
5. Al work you do not want to be marked must be clearly crossed out.
6. Write neatly and legibly.

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QUESTION 1

1.1 What is the radix of a decimal number? (1)

1.2 Why is the binary number system used in computer circuitry? (2)

1.3 Explain the term *weighted code* and also give an example of the code. (3)

1.4 How many flip flops are needed for a module 7 counter? (1)

1.5 Explain the term *propagation delay* when referring to an IC. (2)

1.6 Use the laws and identities of Boolean algebra to simplify the following expressions:

1.6.1 X + X

1.6.2 ABC + ABC

1.6.3 1 + XY + X

1.6.4 A + $\overline{A}$B

1.6.5 A + B

(5 × 1) (5)

1.7 Convert 11001101101 XS3 to decimal. (3)
[17]

QUESTION 2

2.1 Use the 2's complement method to calculate X+Y if:

X= FE,7$_{16}$ and Y = -1D,5$_{16}$

Convert the final answer to the decimal system. (6)

2.2 Convert each of the following numbers to their binary equivalent and complete the calculation in the binary number system.

Use 1's complement and convert the final answer to the decimal system.

2.2.1 3A,E7$_{16}$ × 15,0625$_{10}$

2.2.2 1010110,1$_2$ ÷ 11011$_2$

2.2.3 -17,25$_{10}$ – 12,5$_{10}$

(3 × 6) (18)
[24]

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QUESTION 3

3.1 Simplify the following Boolean expressions:

3.1.1 $A\bar{B}\bar{C}D + ABC\bar{D} + \bar{A}\bar{B}\bar{C}D + \bar{A}\bar{B}C\bar{D} = F$

3.1.2 $C(A+\bar{B}) + A(B+\bar{C})+\bar{A}B = F$

(2 × 6) (12)

3.2 Draw the circuit diagram of the Boolean expressions below. Do NOT simplify the expressions:

3.2.1 $\overline{\overline{AB} \oplus \overline{BC} + A\bar{B}C} = F$

3.2.2 $\overline{\overline{X + \bar{Y}Z} \oplus X\bar{Z}} = F$

(2 × 6) (12)
[24]

QUESTION 4

4.1 Draw the circuit diagram of a serial binary adder. Use 0101 and 0110 as inputs. (8)

4.2 Make a neat, labelled sketch of a module 7 up counter. Also include a truth table and the timing diagram for 8 clock pulses. (10)
[18]

QUESTION 5

5.1 Draw a block diagram of the ramp type A/D converter. (10)

5.2 Draw a neat circuit diagram of a 1 line to 4 lines demultiplexer. (7)
[17]

TOTAL: 100

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